

# MENTHA SUAVEOLENS AND *M. ×ROTUNDIFOLIA* IN NORTH CAROLINA: A CLARIFICATION OF DISTRIBUTION AND TAXONOMIC IDENTITY

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## ABSTRACT

A clarification of the distribution and identity of *Mentha suaveolens* and *Mentha ×rotundifolia* is presented. Naturalized populations of *M. ×rotundifolia* are reported from North Carolina for the first time. Previous reports of *M. ×rotundifolia* were based on misapplication of the non-hybrid name *M. rotundifolia* to *M. suaveolens*. *Mentha ×rotundifolia* is now known to be well established in northwestern North Carolina and several new populations are documented. A population of *M. suaveolens* is also reported for the first time since 1970. This species is apparently scattered and uncommon in North Carolina. Contrary to previous literature reports *M. longifolia* does not appear to be present in North Carolina. A key and photographs are provided to assist in the identification of these taxa.

## RESUMEN

Esta investigación presenta una clarificación de la distribución e identidad de *Mentha suaveolens* y *Mentha ×rotundifolia*. Se encuentran poblaciones naturalizadas de *M. ×rotundifolia* en Carolina del Norte por la primera vez. Las citas anteriores de *M. ×rotundifolia* estaban relacionados con una equivocación en la clasificación del nombre *M. rotundifolia* con *M. suaveolens*. *Mentha ×rotundifolia* se encuentra muy bien establecida en el noroeste de Carolina del Norte y este estudio documenta varias poblaciones nuevas. Por la primera vez desde 1970, se identifica una población nueva de *M. suaveolens*. Esta especie aparece muy dispersa en Carolina del Norte. Al contrario de publicaciones anteriores, *M. longifolia* no aparece en Carolina del Norte. Se incluyen una leyenda y fotos para apoyar la identificación de estos taxa.

## INTRODUCTION

The genus *Mentha* has traditionally been regarded as taxonomically difficult. High levels of morphologic plasticity within this group have been attributed to rampant hybridization, polyploidy, colonial mutant propagation, and the persistent/spreading nature of nothomorphs (Stace 1997; Tucker & Chambers 2002; Bunsawat et al. 2004). In addition, the genus *Mentha* is extensively cultivated for its economic value (e.g., culinary use, essential oil production, ornamental value) (Mabberley 1997; Sutour et al. 2008). As a result of such hybridization and the continued human introduction of multiple taxa, misidentification and uncertainty in the literature is expected.

The primary purpose of this paper is to clarify the distribution and taxonomic identity of what has traditionally been referred to as *Mentha rotundifolia* auct. non. (L.) Huds. in North Carolina. It is beyond the scope of this paper to address all the taxa within the genus *Mentha*. Rather, we will focus on the state-wide distribution and confusion of a single taxonomic concept that has been traditionally misapplied in this state and elsewhere. The information presented will also assist in the identification of *Mentha* specimens in other geographic areas where the concept of *M. rotundifolia* has been applied.

## THE PROBLEM

While collecting in northwestern North Carolina we encountered a confounding member of the genus *Mentha* at a several scattered localities. All of these specimens had terminal inflorescences and pubescent, rugose leaves. These plants most closely matched the concepts of *M. rotundifolia* and *M. longifolia* (L.) L. in the *Manual of the Vascular Flora of the Carolinas* (Radford et al. 1968) and the concept of *M. suaveolens* Ehrh. in the *Flora of the Carolinas, Virginia, and Georgia, northern Florida, and surrounding areas* (Weakley 2008). *Mentha*



*rotundifolia* is now considered to be a hybrid derived from a cross between *M. longifolia* and *M. suaveolens* and is referred to as *M. ×rotundifolia* (L.) Huds. (Tucker & Naczi 2007). The name *M. rotundifolia* has been misapplied to *M. suaveolens*, *M. ×rotundifolia* and *M. ×villosa* Huds. on herbarium sheets, in the literature, and in the herb trade (A.O. Tucker, pers. comm.). In addition, *M. rotundifolia* has been erroneously considered synonymous with *M. suaveolens* by some authors (e.g., Sutour et al. 2008).

*Mentha longifolia*, *M. suaveolens* and *M. ×rotundifolia* have all been considered infrequent escapes in North Carolina and are only reported from a few counties (Wofford 1989; Radford et al. 1968; USDA, NRCS 2009). The *Mentha* we encountered has apparently become well established outside of cultivation in Alleghany, Ashe and Watauga counties. For this reason we set out to clarify the identity of these plants and to determine where they had previously been documented in North Carolina.

#### METHODS

In addition to our own field collections, we requested all specimens labeled as *M. ×rotundifolia*, *M. suaveolens*, *M. longifolia*, including relevant synonyms, as well as *Mentha* specimens not identified below genus from all major North Carolina herbaria. Additionally, we requested loans of the type specimens of *M. suaveolens* and *M. spicata* L. var. *rotundifolia* L. from GOET and UPS respectively. Tucker and Naczi (2007) was used for identifying basionyms and locating the institutional repositories for the type specimens. Specimens were examined from the following herbaria: BOON, DUKE, NCSC, NCU, UNCC, WCU, and WNC. All herbarium acronyms follow Index Herbariorum (Holmgren & Holmgren 1998). High resolution digital photos of the lectotype specimens of *M. suaveolens* and *M. spicata* var. *rotundifolia* were also examined. In all, we examined 10 vouchers and respective duplicates of *M. ×rotundifolia* and 12 of *M. suaveolens* from North Carolina. In addition, we examined many vouchers of cultivated *Mentha* hybrids from the herbarium of M.J. Murray supplied by A.O. Tucker.

#### RESULTS

The examination of type specimens and previously published literature (e.g., Stace 1997; Tucker & Naczi 2007), revealed 11 vouchers of *M. suaveolens* and one previous collection of *M. ×rotundifolia* from North Carolina. No specimens of *M. longifolia* were seen. Our own field work in northwestern North Carolina located 9 new populations of *M. ×rotundifolia* and one new population of *M. suaveolens* (Fig. 1). Our specimens represent the first known accounts of naturalized populations of *M. ×rotundifolia* in North Carolina and the first collections since 1990. Prior to this study, *M. suaveolens* had not been collected since 1970. *Mentha longifolia* has apparently not yet been legitimately documented for North Carolina.

A key, specimen citations, and photographs (Fig. 2) are provided below to facilitate the identification of additional populations of *M. ×rotundifolia* or *M. suaveolens*. We include *M. longifolia*, *M. spicata* and *M. ×villosa* in the key because they have been confused with *M. ×rotundifolia* or *M. suaveolens* in the past. *Mentha longifolia* and *M. ×villosa* have not been documented from North Carolina; however, these taxa have been reported from the eastern United States (e.g., Rhoads & Block 2007; Weakley 2008, Tucker in press). We therefore include these taxa in the key to increase its utility. Most of the specimens examined were readily identifiable as either *M. ×rotundifolia* or *M. suaveolens*. However, some specimens had primary affinities with *M. suaveolens*, but exhibited some intermediacy. As pointed out by Stace (1997), these intermediate taxa are usually hybrids involving *M. suaveolens* and can be difficult to distinguish. However, the following key can be reliably used to separate *M. ×rotundifolia* and *M. suaveolens* for a great majority of specimens. Back crosses between *M. ×rotundifolia* and its parents have been documented in common garden settings, though it is not clear if this occurs in naturalized populations. The taxa included in the key can be distinguished from other *Mentha* taxa in North Carolina by the presence of a terminal spike with densely crowded flowers. It should be noted that 3 subsp. of *M. suaveolens* have been recognized by Tucker and Naczi (2007). In addition to the type subsp. these authors recognized subsp. *insularis* (Req.) Greuter and subsp. *timija* (Coss. ex Briq.) Harley ex Harley & Brighton. However, neither a key nor a description is presented by Tucker and Naczi



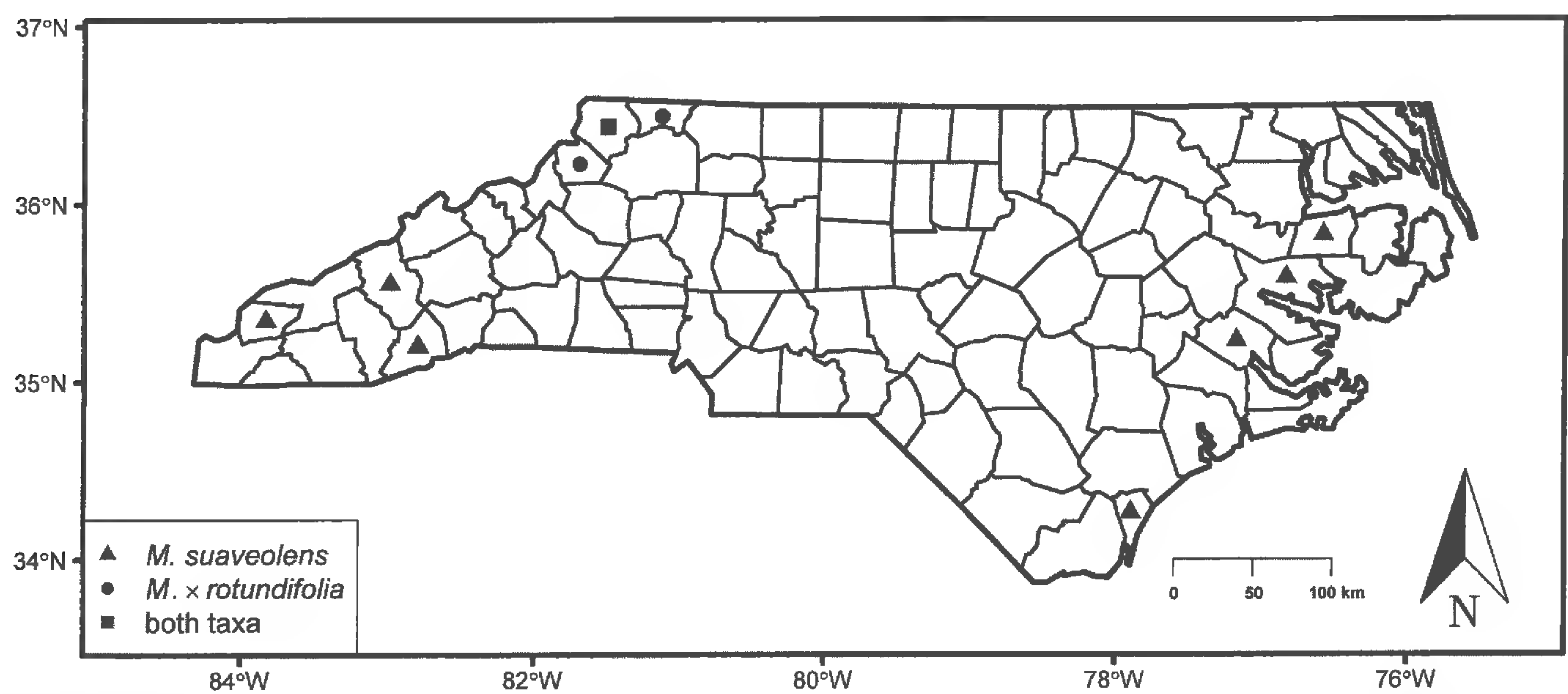


FIG. 1. County level distribution of *M. suaveolens* and *M. ×rotundifolia* in North Carolina (based on specimens from BOON, DUKE, NCSC, NCU, UNCC, WCU and WNC). Symbols are mapped on county centroids.

(2007) to separate these 3 taxa. Harley (1972) expresses doubt as to the distinctiveness of *M. insularis* Req. (= *M. suaveolens* subsp. *insularis*), while subsp. *timija* is not mentioned by Harley since it is outside the geographic scope of this treatment. In short, it is difficult at this time to definitively identify which subsp. of *M. suaveolens* is present in North Carolina, but after a review of existing literature, we have tentatively defaulted with Weakley’s (2008) recognition of ssp. *suaveolens*. Future taxonomic studies across the native and introduced ranges of *M. suaveolens* are needed to define these taxa.

KEY TO SELECTED TAXA OF MENTHA

Key adapted from Stace (1997), Tucker and Naczi (2007), Weakley (2008) and Tucker (in press). Note: Taxa included within brackets are not currently known from North Carolina.

- 1. Leaves lanceolate to oblong-lanceolate
  - 2. Abaxial leaf hairs unbranched, leaves widest near the middle, slightly rugose; fertile anthers 0.28–0.38 mm long, generally musty-odored ( $2n = 24$ ) \_\_\_\_\_ [*M. longifolia*]
  - 2. Leaves oblong-lanceolate, adaxially glabrous, rarely with tree-like hairs on undersurface, leaves widest near base, conspicuously rugose; fertile anthers 0.38–0.52 mm, generally spearmint-odored ( $2n = 48$ ) \_\_\_\_\_ *M. spicata*
- 1. Leaves oblong to ovate
  - 3. Leaves generally 1–2× as long as wide, ovate-suborbicular, broadly rounded to subcordate at the base, apex obtuse; leaf serrations rounded and often turned downward (thus appearing somewhat crenate); leaf surface strongly rugose, with scattered dendritic hairs on the abaxial surface; sweet/sickly scented ( $2n = 24$ ) \_\_\_\_\_ *M. suaveolens*
  - 3. Leaves generally 1–3× as long as wide, ovate to oblong, broadly cuneate to rounded at the base, apex acute; leaf serrations sharp and patent, leaf surface moderately rugose; spearmint scented.
    - 4. Leaves generally oblong, with nearly parallel sides and a broad rounded base; each flower generally with 4 fertile anthers ( $2n = 24$ ) \_\_\_\_\_ *M. xrotundifolia*
    - 4. Leaves generally ovate, infrequently oblong; scattered fertile anthers sometimes present ( $2n = 36$ ) \_\_\_\_\_ [*M. xvillosa*]

Voucher specimens for *Mentha xrotundifolia*: **NORTH CAROLINA. Alleghany Co.:** Glade Valley, located along US 21 S, ca. 1 mi past Glade Valley Rd., latitude 36.4651, longitude -81.0502, 28 Aug 2008, *Poindexter 08-983* (BOON). **Ashe Co.:** ca. 1.25 mi down William T. Calloway Road, near Bluff Mountain Gameland, latitude 36.3684, longitude -81.5738, 22 Sep 2007, *Zgieb s.n.* (BOON); Orion, located along NC 88/16, ca. 1 mi from 16 S divergence and the South Fork of the New River, traveling E just past Frank Dillard Rd., latitude 36.3956, longitude -81.4185, 28 Aug 2008, *Poindexter 08-993* (BOON). West Jefferson, located at the base of Mount Jefferson, at the jct. of Oakwood Rd. and Cottontail Trail, latitude 36.3878, longitude -81.4663, 7 Aug 2008, *Poindexter 08-673* (BOON). West Jefferson, located







with a majority of the vouchers made between mid August and late September. The average collection date was the 9<sup>th</sup> of September.

Voucher specimens for ***Mentha suaveolens***: **NORTH CAROLINA. Ashe Co.:** Jefferson, Mount Jefferson State Natural Area and environs, S.R. 1152, growing along disturbed embankment adjoining woodlands, at latitude 36.3925 and longitude -81.4674, 11 Aug 2005, *Poindexter 05-1695* (BOON); same as previous locality, 21 Oct 2007, *Poindexter 07-874* (BOON, DOV). **Beaufort Co.:** Belhaven, Salt marsh, 6 Jul 1958, *Radford 36297* (NCU). **Craven Co.:** New Bern, waste place, 19 Jul 1958, *Radford 37332* (NCU). **Graham Co.:** meadow border, 2.5 mi N of Robbinsville, on [U.S.] 129, 20 Jun 1965, *Crisp s.n.* (WCU). **Haywood Co.:** Creek side, 5.2 mi ENE of Crabtree, 5 Jun 1958, *Ahles & LaDuke 42139* (NCU). **New Hanover Co.:** Wilmington, moist thicket, 7 Jul 1938, *Godfrey 4880* (NCSC); Wilmington, E bank of Cape Fear River off U.S. 421, marshy field, 6 Aug 1966, *Bradley & Stevenson 3395* (BOON, DUKE, NCU, UNCC, WCU, WNC not seen); along railroad tracks on E side of Northeast [Cape Fear] River at US 17, Wilmington, 23 Oct 1968, *Leonard & Radford 2214* (NCU); Wilmington, ballast area, Northeast [Cape Fear] River, 22 Aug 1970, *Leonard 3553* (WCU). **Transylvania Co.:** Cascade Lake, 15 Aug 1958, *Freeman 58312* (NCU). **Washington Co.:** 0.4 mi E of Plymouth, fresh-water marsh, near Roanoke River, 5 Aug 1958, *Radford 38817* (NCU).

**Habitat and Phenology.**—*Mentha suaveolens* is primarily restricted to moist or wet areas such as lake shores, creek sides and salt marshes. It has also been observed in disturbed sites such as along railroads and road embankments. This species has been collected between early June to late October, though a majority of the specimens were vouchered between early July and mid August. The average collection date was the 5<sup>th</sup> of August.

#### DISCUSSION

Naturalized populations of *M. ×rotundifolia* sensu Tucker and Naczi (2007) are reported from North Carolina for the first time. This hybrid has been reported from North Carolina previously (e.g., USDA, NRCS 2009); however, as stated above, these reports were apparently based on misapplication of the name *M. rotundifolia* to *M. suaveolens*.

*Mentha ×rotundifolia* is widely cultivated and this is most likely the pathway by which this plant was introduced into North Carolina. Horticulture and agriculture are common vectors of plant introduction to new areas (Reichard & White 2001). *Mentha ×rotundifolia* has been cultivated in the Boone area for at least 50 years. We examined a vouchered garden planting of *M. ×rotundifolia* dated 1957 from Davidson (Mecklenburg County) that was ‘transplanted from Boone, N.C.’ [*Brown 689*, 10 July 1957, (UNCC)]. Today, cultivated stems are sold at local farmer’s markets in western North Carolina [*Denslow 2591*, 30 Aug 2008, (BOON)]. Regardless of the mode of introduction, this plant is now well established outside of cultivation. Although we have observed naturalized populations in close proximity to cultivated plants, most populations appear to be established in more disparate localities. It is most successful in moist areas near water sources where it can become the dominant plant.

In light of the prevalence of *M. ×rotundifolia* in northwestern North Carolina, it is unclear why this plant was only collected once prior to 2007. One possible explanation is that this plant has simply been overlooked by collectors. Another possibility is that *M. ×rotundifolia* has only recently become successful outside of cultivation. Long periods from initial establishment to subsequent spread or ‘lag times’ are commonly observed for introduced species (Lockwood et al. 2007). Explanations for these lag times include an increase in positive biotic interactions and post-establishment evolution that promotes range expansion (Lockwood et al. 2007). It is also possible that the rate of introduction (i.e., propagule pressure, Lockwood et al. 2007) has increased in recent years.

A previous report by Radford et al. (1968) of *M. longifolia* from Gates County, North Carolina was based on a misidentification of *M. spicata*. Radford et al. (1968, p. 924) reports *M. longifolia* as a ‘very rare escape’ from a ‘roadside ditch’. This report is apparently based on a specimen collection by H.E. Ahles on 1 Aug 1958 and is now listed as *M. spicata* in the NCU database (<http://www.herbarium.unc.edu/seflora/firstviewer.htm>). Thus, *Mentha longifolia* has not yet been collected in North Carolina.

The first report of *M. rotundifolia* for North Carolina appears to be from the Wilmington area (Curtis 1834). Curtis’s (1834) description of this plant indicates that it may actually be *M. suaveolens*. Curtis (1834,



p. 26) states that the plants have leaves that are “roundish, rugose, crenate, sessile” and are “unpleasantly scented.” These characters are consistent with *M. suaveolens*, though voucher specimens for this report have not yet been located.

Radford et al. (1968) apparently misapplied the name *M. rotundifolia* to specimens of *M. suaveolens*. This misapplication may have caused other authors (e.g., NRCS-USDA 2009; Weakley 2008) to incorrectly report *M. × rotundifolia* from North Carolina. Contrary to these reports we examined no previous specimens labeled *M. × rotundifolia* from North Carolina. We did however locate a specimen of *M. × rotundifolia* collected in 1990 [Basinger 853, (UNCC)] that was misidentified as *M. spicata*. This specimen seems to be the first known collection of *M. × rotundifolia* from North Carolina.

Based on current herbarium records, *M. suaveolens* appears to infrequently establish in North Carolina. It is possible however that this taxon is more frequent, but has been overlooked by collectors. Future plant collecting and detailed habitat descriptions will help determine if this plant persists at the historic sites where it has been documented. In particular, *M. suaveolens* should be sought in the Wilmington area where it was collected several times in the past.

#### ACKNOWLEDGMENTS

We extend our appreciation to the curators and staff of DUKE, NCSC, NCU, UNCC, WCU, and WNC for access to their specimens, as well as GOET and UPS for images of type specimens. We would like to thank Arthur O. Tucker for verification of our original specimens, for generously providing specimens of *Mentha* hybrids and valuable insights that improved the manuscript. We are especially grateful for the helpful suggestions on this manuscript provided by Christine Edwards, Gabrielle Katz and the Spanish translation of the abstract provided by L. Baker Perry. Funds to offset publication costs were graciously provided by the Graduate Student Association Senate at Appalachian State University.

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